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MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY.

COMMUNICATED BY E. B. TITCHENER.

XIV.—A STUDY OF CERTAIN METHODS OF DISTRACT- ING THE ATTENTION.

II.—DISTRACTION BY ODORS.

BY L. G. BIRCH, PH. B.

The present Study is a continuation of the work begun by Mr. Moyer in Study XII. Our aim is to discover a means of distraction that shall be (1) capable of gradation, (2) uniform in its working, and (3) applicable to normal subjects. Mr. Moyer's preliminary work with scents promised so well that it seemed desirable to make a direct test of the efficacy of odors in distraction. The experiments lasted during the academic year 1896-7. We supposed, beforehand, that a year would afford time enough for obtaining an answer to our question in the particular field chosen (discrimination of sound intensities). The result shows that a longer period is necessary. As the investigation cannot be carried on for another year with the same subjects, we publish the Study as it stands, though with full consciousness of its incompleteness.

Two sounds of different intensities were given by means of a fall-phonometer (Willyoung & Co., Philadelphia). The sounds were produced by the dropping of ivory balls upon ebony plates through distances of 50 and 55 cm., respectively. The portion of the acoustic room used for the experiments was curtained off in such way as to exclude echo or reverberation of any sort; and the apparatus was rigorously tested by the experimenter, before a series began, for the detection of qualitative differences between the sounds due to possible maladjustment of parts of the phonometer. The subject sat with his back to the instrument, and passed judgments of relative intensity in accordance with the method of right and wrong cases. The experiments fell into three groups:

- (1) practice experiments before distraction;
- (2) distraction experiments;
- (3) test experiments after distraction.

Four subjects took part in the investigation: Mrs. S. T. Oliver (*O.*), Miss N. G. Seymour (*S.*), Mr. I. M. Bentley (*B.*), and Dr. W. B. Pillsbury (*P.*). The writer of the Study was experimenter throughout.

I. *Practice Experiments.* All four subjects had had practice with the phonometer in 1895-6, whether in the course of investigation or in the laboratory drill-work. We therefore thought it unnecessary to devote any considerable amount of time to practice experiments. After a few days' work the percentage of *r* cases became practically constant for all. We then took the following standard experiments, in series of 20:

<i>B.</i> , 240 exp.,	$r=73.3\%$;
<i>O.</i> , 200 "	$r=91\%$;
<i>P.</i> , 100 "	$r=85\%$;
<i>S.</i> , 240 "	$r=67.3\%$.

We purposely kept the height of fall of the balls the same for all subjects, thinking it well to test the value of the odor distraction upon judgments of supraliminal, liminal and subliminal differences. The limits 91 and 67 per cent. afforded a range sufficient for this end.

Unfortunately, although the percentage was 'practically constant' in these practice experiments,—the m. v. of the series being very small,—the event proved that our preliminary work was inadequate. The percentages increased as the experiments were continued. See (III), below.

II. *Distraction Experiments.* Not only did the subjects differ as regards power to discriminate sound intensity; they differed—and this, also, we took to be useful for the purposes of our test—in their mode of reaction upon smell stimuli. *B.* and *P.* were familiar with the scents of the chemical and anatomical laboratories; *O.* knew the odors of the plants which she had studied in the botanical laboratory; *S.* was keenly affected by scents, pleasant or unpleasant, but was unfamiliar with names.

Fifty scents were employed: 1, oil of cloves; 2, oil of tansy; 3, oil of pennyroyal; 4, oil of origanum; 5, oil of spike; 6, oil of orange; 7, extract of coffee; 8, extract of pineapple; 9, extract of raspberry; 10, extract of white rose; 11, extract of violet; 12, extract of heliotrope; 13, powdered orris; 14, tincture of iodine; 15, paregoric; 16, tincture of arnica; 17, powdered licorice; 18, oil of bergamot; 19, bay rum; 20, lavender water; 21, menthol; 22, veronica; 23, banana; 24, peppermint; 25, carbolic acid; 26, benzine; 27, cinnamon; 28, methyl alcohol; 29, oil of thyme; 30, olive oil; 31, naphthalene; 32, brandy; 33, ammonium sulphide;

34, bromine water; 35, spearmint; 36, camphor; 37, hemlock; 38, oil of turpentine; 39, anise; 40, rosemary; 41, Javelle water and chlorine; 42, vanillin; 43, formalin; 44, acetic acid; 45, rye whiskey; 46, absolute alcohol; 47, oil of bitter almonds; 48, cotton seed oil; 49, nitro-wurtzite; 50, wintergreen.

The small phials containing these odors were covered with paper; so that the subject could not judge of the scent by the appearance of the substance. The corks were numbered according to the above list. The phials needed for an experimental series were laid out in order upon a low table at the subject's side. At a 'Ready!' he took up the phial nearest him, and held it in his left hand. Two seconds after a 'Now!' had been called, the first ball dropped. As soon as the sound had been apperceived, the subject uncorked the phial and smelled the contents. After an interval of five seconds the second ball was let fall. Judgment was passed, first, upon the intensity of the sounds; and then remarks made upon the nature of the odor.

We supposed, before beginning the experiments, that a single smell would not be sufficient to fill up the full five seconds, and devised various ways of meeting the difficulty which would thus arise. In practice, however, the difficulty did not occur; the single distraction proved adequate in every case.

Following are four typical series, one from each subject. A height of fall of 55 cm. is represented by *a*, that of 50 cm. by *b*.

SERIES I. REACTOR O. JAN. 16, 1897.

Exp.	Stim.	Scent	Judgt.	REMARKS.
1.	<i>ab</i>	39	<i>w</i>	"Odor familiar; do not know the name."
2.	<i>ab</i>	40	<i>r</i>	"Pleasant perfume."
3.	<i>ba</i>	41	<i>r</i>	"Do not know it at all."
4.	<i>ba</i>	42	<i>r</i>	"Do not know; sweetish, like a flavoring extract."
5.	<i>ab</i>	43	<i>r</i>	"Pungent, like the horse-radish group."
6.	<i>ab</i>	44	<i>w</i>	"Do not know at all; never smelled it before."
7.	<i>ab</i>	45	<i>r</i>	"Whiskey."
8.	<i>ba</i>	46	<i>r</i>	"Faint odor."
9.	<i>ba</i>	47	<i>r</i>	"Like bitter almonds."
10.	<i>ba</i>	48	<i>r</i>	"No definite odor; thought of olive oil."
11.	<i>ab</i>	49	<i>r</i>	"Bitter almonds certainly."
12.	<i>ab</i>	50	no jdgt.	"Wintergreen."
13.	<i>ab</i>	1	<i>w</i>	"Familiar; cannot name."
14.	<i>ba</i>	3	<i>r</i>	"Spearmint."
15.	<i>ba</i>	5	<i>r</i>	"No odor."
16.	<i>ba</i>	7	<i>r</i>	"Coffee."
17.	<i>ab</i>	9	<i>r</i>	"Little like burnt molasses."
18.	<i>ba</i>	11	<i>r</i>	"Violet."
19.	<i>ab</i>	13	<i>r</i>	"Faint; do not know."
20.	<i>ba</i>	15	<i>r</i>	"Ipecacuanha."

SERIES II. REACTOR B. FEB. 10, 1897.

1.	<i>ab</i>	36	<i>r</i>	"Familiar; cannot name."
2.	<i>ab</i>	38	<i>r</i>	"Turpentine."
3.	<i>ba</i>	40	<i>w</i>	"Fruit-like."
4.	<i>ba</i>	42	<i>r</i>	"Paper-like smell."
5.	<i>ab</i>	44	<i>r</i>	"Do not know; not familiar."
6.	<i>ab</i>	46	<i>r</i>	"Alcohol."
7.	<i>ab</i>	48	<i>w</i>	"Do not know; not a strong odor."
8.	<i>ba</i>	50	<i>r</i>	"Peppermint."
9.	<i>ba</i>	1	<i>?w</i>	"Vague idea of the smell."
10.	<i>ba</i>	3	<i>r</i>	"Familiar, but cannot name."
11.	<i>ab</i>	5	<i>r</i>	"Like turpentine."
12.	<i>ab</i>	7	<i>r</i>	"Coffee."
13.	<i>ab</i>	9	<i>w</i>	"Do not know."
14.	<i>ba</i>	11	<i>r</i>	"Perfume."
15.	<i>ba</i>	13	<i>r</i>	"Perfume."
16.	<i>ba</i>	15	<i>r</i>	"No clear idea of the smell."
17.	<i>ab</i>	17	<i>w</i>	"Do not know; thought of coffee."
18.	<i>ab</i>	19	<i>r</i>	"Perfume."
19.	<i>ba</i>	21	<i>w</i>	"Unfamiliar."
20.	<i>ba</i>	23	<i>w</i>	"Doubtful: banana?"

SERIES III. REACTOR S. FEB. 2, 1897.

1.	<i>ab</i>	30	<i>r</i>	"Grease, soap; not familiar."
2.	<i>ba</i>	33	<i>w</i>	"Ammonia."
3.	<i>ba</i>	36	<i>r</i>	"Camphor."
4.	<i>ab</i>	38	<i>w</i>	"Like turpentine."
5.	<i>ab</i>	41	<i>w</i>	"No particular odor; like an old medicine bottle."
6.	<i>ab</i>	43	<i>r</i>	"Burning stuff, disinfectant."
7.	<i>ba</i>	47	<i>w</i>	"Must be bitter almond."
8.	<i>ba</i>	29	<i>r</i>	"Lavender."
9.	<i>ab</i>	31	<i>r</i>	"Moth balls."
10.	<i>ab</i>	32	<i>w</i>	"Alcohol."
11.	<i>ab</i>	28	<i>r</i>	"Some chemical that I have smelled in a tin-type shop."
12.	<i>ba</i>	24	<i>r</i>	"Peppermint."
13.	<i>ba</i>	23	<i>r</i>	"Some chemical in gilding mixture; somewhat like orange blossom."
14.	<i>ba</i>	26	<i>r</i>	"Chloroform."
15.	<i>ab</i>	21	<i>w</i>	"Perfectly familiar; cannot name."
16.	<i>ba</i>	35	<i>w</i>	"Mint."
17.	<i>ab</i>	37	<i>w</i>	"Very familiar; like pine needles; out-of-door-like."
18.	<i>ba</i>	49	<i>r</i>	"Bitter almonds."
19.	<i>ba</i>	1	<i>w</i>	"Kitchen odor; vanilla?"
20.	<i>ab</i>	3	<i>w</i>	"Delicious country smell; out-of-door odor."

SERIES IV. REACTOR P. MARCH 9, 1897.

1.	<i>ab</i>	1	<i>w</i>	"Some sort of spice."
2.	<i>ab</i>	2	<i>r</i>	"Wormwood."
3.	<i>ba</i>	3	<i>w</i>	"Pennyroyal."
4.	<i>ba</i>	4	<i>r</i>	"Faint, indefinite odor."
5.	<i>ab</i>	5	<i>r</i>	"Do not know."
6.	<i>ab</i>	6	<i>r</i>	"Orange."
7.	<i>ab</i>	7	<i>w</i>	"Knew it once."

8.	ba	41	r	"Chloride of lime."
9.	ba	50	r	"Wintergreen."
10.	ba	46	r	"Whiskey."
11.	ab	37	r	"Do not know; seems familiar."
12.	ab	49	r	"Almonds."
13.	ab	44	r	"Very faint."
14.	ba	48	r	"Cannot smell it."
15.	ba	47	r	"Almonds."
16.	ba	40	w	"Catnip."
17.	ab	42	r	"Sour paste."
18.	ba	43 no	jdgt.	"Mustard."
19.	ab	45	w	"Do not know; nose burnt."
20.	ba	35	r	"Peppermint."

The above *Remarks* are, in some cases, much condensed from the experimental records. But they show fairly well the material that one has upon which to base an induction as to why certain odors distracted and others did not. It is clear that the subjects show great individual differences in the matter of distraction. We should think, *a priori*, that an odor would distract when it was either (1) familiar, but not to be named, or (2) so familiar as to set up a vivid train of associated ideas. Series I. fits in with this assumption pretty well: the three *w* fall under the first heading, the *no jdgt.* under the second. At the same time there are several exceptions to the latter rubric. On the whole, it seems fair to say that the reactor *O.* was most distracted by familiar smells which could not be named. The following introspective accounts are typical:

Rosemary.—"Did not know the scent. Little like tansy, but sweeter. Some kind of eau de cologne? Sweetish, and a little aromatic. Worried lest I should not know what the scent was by the time that the second ball fell. Think now that I could recognize it if I smelled again. Seemed unfamiliar, but a perfumery smell. When the ball fell I thought 'There, that is gone, and I do not know what it is.' No associated ideas. Feeling of annoyance that I could not tell what it was."

Absolute Alcohol.—"Seems to be chiefly alcohol. Something else in it, perhaps. Could not recognize it at once, though it seemed familiar. Thought of cinnamon, but it was not that. Scent of the perfume order. Just as ball fell thought, 'It's like weak alcohol.' Associations after the ball fell, not before."

Banana.—"Idea of beech nuts flashed up, but was not a decision. Strong and peculiar odor. Not like a perfume; lacking in delicacy and fragrance. Not like chemicals. Feeling of dissatisfaction at not recognizing it before the ball fell. Worried afterwards for a little; scent came back and seemed on the point of being grasped."

As an instance under the second heading we have this, *e. g.*:

Carbolic Acid.—"Prompt judgment both of balls and scent. Carbolic acid. Having recognized, was going to take another sniff when I thought: 'What's the use? You know that.' Just then the ball dropped." The judgment was a *w*.

The reactor *B.*, on the other hand, seems to have been

most distracted, not when he could not name a familiar smell, but when the smell was altogether unfamiliar. The attention in this case did not relax, as one might have expected,—perhaps owing to the shortness of the interval,—but played upon the unknown stimulus through the five seconds. *E. g.* :

Cinnamon.—“Hard to remember the balls after smelling. Had no idea what the smell was. No associations. Kept smelling all the time.”

Violet.—“Some perfume? No idea of the kind; but seems a good sort. Kept smelling. No associations.” Both judgments *w*.

The reactor *P.*, again, tended to let the distraction go, when he could not recognize the scent, and to concentrate his attention upon the coming sound. There was little if any sign of the ‘worry’ and ‘annoyance’ of the subject *O.* *P.*’s recognitions, right and wrong alike, were very quick; and the jerk of recognition appears to have distracted him more than the steady feeling of unfamiliarity.

The reactor *S.* showed a much greater tendency to association during the five seconds’ limit than any of the other three subjects. She was distracted by these as well as by the annoyance of inability to name. Thus tansy suggested sage tea, and that the giving of sage tea at the new moon. Pennyroyal suggested the mustiness of a certain old house; rosemary suggested a toilet table and also cooking in a kitchen; etc., etc. *S.* hardly ever found a scent wholly unfamiliar. *O.* stands next to her in this respect. *B.* and *P.* often ‘gave up’ the problem of recognition.

Putting all the facts together, one may say that a scent can distract: (1) when it is familiar, but cannot be named, and so ‘bothers’:

(2) when it is very familiar, and so suggests scenes and events readily:

(3) when it is totally unfamiliar, and so piques the attention; and

(4) when it is easily recognized, and so sets up a general feeling of relief that the trial is over.

There are very few *w* that cannot be accounted for on some one or other of these four principles; and what there are can be traced, almost without exception, to a slipping of the attention, due to tiredness, preoccupation, the unusual obstinacy of a cork, etc.

III. *Final Test Experiments.* At the conclusion of the whole inquiry 100 experiments were made upon each subject, without distraction, with the view of discovering any advance in practice. As was said above, practice had, unfortunately, advanced. The percentages of *r* cases before distraction were:

<i>B.</i>	<i>O.</i>	<i>P.</i>	<i>S.</i>
73.3	91	85	67.3 ;

after distraction they were :

80	96	94	76.
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The order of relative accuracy of discrimination is the same as before ; the absolute accuracy has increased for each subject. We can do nothing but confess that our preliminary work was cut too short, and that our final results are so far invalid.

What, now, are the final *results* of the whole investigation? How do the distraction percentages of *r* cases compare with the percentages when there was no distraction?

We have sought to answer this question in the following Table. To construct the Table we first averaged the per cent. of *r* without distraction from the practice experiments and the final tests ; thus obtaining

<i>B.</i>	<i>O.</i>	<i>P.</i>	<i>S.</i>
76.6	93.5	89.5	71.6

as our standard percentages. From these we subtracted the per cent. of *r* for each subject and for each of the fifty scents. The column headed 'per cent.' thus gives the *difference* between the per cent. of *r* without distraction and the per cent. of *r* with distraction by a particular scent. The scent is indicated by its number. The number of distraction-experiments from which the per cent. of *r* with distraction was calculated varied for the various subjects and scents. It is shown in the column headed 'No.' Thus, in the first line of the Table, the figures mean that for the reactor *O.* the scent 49 (nitro-wurtzite) was the most efficient distractor ; it was presented in 14 series ; and the percentage of *r* cases when it was used was no more than 93.5 *minus* 51.5, *i. e.*, 42. And so on.

Remarks upon the Table. (1) It is clear that the Table is incomplete ; the column headed 'No.' shows uneven figures. We had hoped to have 20 series for each scent ; but of this time did not allow. Neither had we time for any control experiments, outside of and beyond the regularly arranged and varied experimental series. Lastly, it must be remembered that practice was changing during the experiments ; so that the order of the scents in distracting value may not be entirely correct. The practice effect, *i. e.*, may have differed at different stages of the work ; and the form of the practice curve may be different for different odors.

REACTOR :	O.			B.			S.			P.		
Distracting Value (highest to lowest).	Scent.	Per cent.	No. of Experiments.	Scent.	Per cent.	No. of Experiments.	Scent.	Per cent.	No. of Experiments.	Scent.	Per cent.	No. of Experiments.
1	49	51.5	14	45	56.3	19	16	52.3	14	38	56.5	6
2	15	47.5	15	47	56.3	19	23	48.3	12	37	52.5	8
3	39	43.5	14	33	54.3	17	34	48.3	12	14	47.5	7
4	19	40.5	15	16	52.3	18	37	45.3	14	7	47.5	7
5	25	37.5	16	48	51.3	15	2	45.3	14	22	46.5	8
6	3	36.5	14	34	46.3	16	4	45.3	14	13	39.5	8
7	35	35.5	17	9	46.3	19	14	45.3	14	40	39.5	8
8	18	33.5	15	46	46.3	19	17	45.3	14	39	35.5	11
9	28	33.5	15	24	44.3	18	21	45.3	13	45	34.5	9
10	36	33.5	15	19	44.3	18	30	43.3	13	20	32.5	7
11	1	32.5	13	30	44.3	15	15	43.3	13	21	32.5	7
12	41	32.5	13	39	44.3	15	22	43.3	13	33	32.5	7
13	43	32.5	13	10	42.3	20	39	43.3	12	41	32.5	7
14	4	31.5	16	17	42.3	17	29	40.3	14	3	29.5	10
15	44	31.5	16	29	42.3	20	19	40.3	14	4	29.5	10
16	12	29.5	14	26	42.3	19	28	35.3	12	23	27.5	8
17	2	27.5	15	35	42.3	20	35	35.3	13	27	27.5	8
18	6	27.5	15	49	42.3	17	3	35.3	13	35	27.5	8
19	21	27.5	15	50	40.3	16	5	35.3	13	31	23.5	9
20	24	27.5	15	22	40.3	16	32	35.3	13	9	18.5	7
21	26	27.5	18	28	39.3	19	44	35.3	14	25	18.5	7
22	27	27.5	15	41	39.3	18	43	33.3	15	34	18.5	7
23	13	25.5	16	43	36.3	17	8	33.3	13	42	18.5	7
24	9	24.5	13	14	36.3	17	50	33.3	15	43	18.5	7
25	22	24.5	13	31	36.3	20	42	31.3	13	50	18.5	6
26	47	24.5	13	2	35.3	19	10	31.3	20	1	17.5	11
27	14	22.5	14	11	35.3	19	13	31.3	14	11	14.5	8
28	20	22.5	14	40	35.3	20	41	30.3	15	2	14.5	8
29	48	21.5	11	32	35.3	17	27	30.3	14	10	14.5	8
30	16	20.5	15	6	33.3	18	7	27.3	15	16	14.5	8
31	17	20.5	15	21	30.3	19	31	27.3	13	26	14.5	8
32	31	18.5	16	1	30.3	17	20	26.3	15	32	14.5	9
33	23	15.5	14	3	30.3	19	1	23.3	14	49	14.5	7
34	34	15.5	14	18	30.3	17	33	23.3	13	8	12.5	9
35	37	13.5	17	23	30.3	19	25	23.3	12	24	6.5	6
36	46	13.5	16	20	30.3	17	12	20.3	13	28	6.5	6
37	5	13.5	15	12	30.3	19	45	20.3	15	48	6.5	6
38	10	13.5	15	25	27.3	18	47	16.3	14	15	4.5	7
39	29	13.5	15	37	27.3	20	49	16.3	14	30	4.5	7
40	33	13.5	15	4	25.3	19	48	13.3	10	44	4.5	7
41	32	12.5	15	44	24.3	15	38	12.3	13	47	4.5	7
42	7	9.5	13	27	22.3	20	6	12.3	13	12	2.5	8
43	38	9.5	15	8	22.3	18	26	10.3	11	29	2.5	8
44	11	8.5	14	36	22.3	20	46	9.3	14	6	1.5	9
45	45	8.5	13	7	21.3	16	9	9.3	14	17	1.5	9
46	50	8.5	11	13	20.3	19	11	4.3	13	19	1.5	9
47	8	7.5	15	5	19.3	17	36	4.3	13	36	1.5	9
48	42	7.5	15	42	13.3	14	18	4.3	13	5	-10.5	10
49	40	1.5	14	15	13.3	17	24	2.3	14	18	-10.5	8
50	30	-6.5	15	38	10.3	20	40	-6	15	46	-10.5	7

(2) It is clear that the different odors have very different distracting values, and that these values differ for the different subjects. Even with 50 scents, taken largely at haphazard as they could be procured, we have a pretty continuous distraction series for each subject, the reduction of the r per cent. ranging from 50 to zero: indeed, in some cases the 'distraction' here, as in our previous work upon distractors, proves to be a stimulant, the subject working better under distraction than under standard conditions.

The mechanism of least distraction or of actual stimulation may be inferred, to some extent, from the introspective records. A few of these are given:

Reactor *O.*, Olive Oil.—(1) Oil; like poor olive oil. (2), (3), (4), (5) Olive oil. (6) Oil. (7) Olive oil. (8) Sweet oil. (9)? Like molasses. (10) Olive oil. (11), (12) Oil. (13) Olive oil. (14), (15) Oil.

Reactor *B.*, Oil of Turpentine.—(1), (2), (3), (4) Turpentine. (5) Cannot name. [This experiment came immediately after the giving of 'turpentine' as the scent of 33.] (6), (7) Turpentine. (8) Varnish. (9), (10), (11), (12), (13) Turpentine. (14) Vague. Had it on the tip of the tongue. [Turpentine had been given earlier in the series for 37.] (15) Know, but cannot name. [No previous turpentine judgment.] (16) Do not know. [Turpentine given earlier in the series for 37.] (17), (18), (19), (20) Turpentine.

Reactor *S.*, Rosemary.—(1) Perfume. Suggests toilet and cooking. (2) Lemon verbena. (3) Perfectly familiar; like lemon. (4), (5) Lavender. (6) Lemon verbena. (7), (8) Lavender. (9) Lemon verbena. (10) Lavender? [Lavender had been given in the series immediately preceding this: hence the doubt.] (11) Lavender? [Same reason for doubt.] (12), (13) Lavender. (14) Sage tea. [Lavender judged in previous series.] (15) Balsam. [Lavender given for 20, a few experiments before.]

Reactor *P.*, Absolute Alcohol.—(1) Odor familiar. Thought of aconite and fever. (2) Do not know; little smell. (3) Do not know. (4) Like cold potato skins. (5) Do not know; sweet. (6) Whiskey. (7) Sweet and sickish.

Oil of Bergamot.—(1) Citron? No; probably heliotrope. (2) Do not know. (3) Orange. (4) No name. (5) Lemon. (6) Perfume. (7) Lemon? (8) Orange.

Oil of Spike.—(1) Familiar; no name. (2) Cannot grasp odor. (3) Faint; do not know. (4) White lead. (5), (6) Unknown. (7) Orange. (8), (9) Unknown. (10) Crude petroleum.

We notice here at once the difference of attitude to the distraction taken up by *O.*, *B.* and *S.*, on the one hand, and *P.*, on the other (cf. the qualitative analysis of distraction above). On the whole, it would seem that least distraction or stimulation means for the first three subjects not so much a dynamogenic effect of stimulus, an actual heightening of the attention, as the reaction of relief upon a quite familiar stimulus; the distraction is put away, and the attention reverts to the sounds. This principle crosses the second distraction-

principle to some extent. We must suppose either that there are here few associates, despite familiarity ; or (what is more likely) that the attention was tending, as things were, rather to the sound than to the scent, and so slipped easily to the sound after recognition was accomplished. In this latter case, the second distraction-principle would hold only providing that the experiment is accurately made, *i. e.*, that the full strain of attention is on the familiar scent. How difficult of attainment this accuracy is, all who have worked at the distraction-problem will know.

P. was distracted when he recognized (fourth principle); the feeling of relief took his attention not only from the scent, but from the whole experiment. In his case, least distraction or stimulation does appear to mean a heightening of the attention ; his *r* per cent. is maximal when he cannot get the smell, when it eludes him, when he can associate to it only a name that he is pretty sure is not correct. (We have found evidence of this principle in our previous work.) *P.*'s tendency was to let the distraction go if he could not recognize the smell at all, but in these instances there seems to have been a feeling that he 'ought' to know the scent.¹

Summary. The Study is incomplete. Not enough series were taken ; not enough practice was had ; no control experiments were made.

In spite of this, it seems from the experimental results that odor series offer a means of distraction of the attention that is uniform, capable of gradation, and applicable to normal subjects. Fifty scents, used for distracting judgments of sound intensity, lowered the *r* per cent. by an amount ranging from fifty to zero : in some instances the lowering passed beyond zero and became an increase.

Individual differences showed themselves, but do not affect the above general statement. We infer from the results that distraction can be set up in four ways : by familiar scents that cannot be named ; by very familiar and therefore suggestive scents (attention on the scent); by unfamiliar and therefore puzzling scents ; and by easily recognizable scents, whose recognition suggests that the whole experiment is over (attention tending away from the experiment). Least distraction or stimulation can be set up in two ways : by very familiar scents (attention on the sound), and by uncertainly

¹ We may just note the fact that the four subjects showed marked differences as regards the way in which the first sound was *memorised* and the judgment of likeness or difference of intensity reached. It was not our object to examine these differences in the present connection.

familiar scents (attention tending away from the experiment, and now held upon it).

It appears that the question of distraction by odors would well repay systematic work, continued for two or three years, and carried over into other departments of intensive discrimination.